

# *Regional Insights*

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FRESH IDEAS

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# Free agents?

## Bridging disciplines with agent-based modelling

**Sara Levy** applauds the usefulness of the agent-based modelling approach, and examines why some academics reject it.

It is not uncommon for the choice of PhD methodology to be made, even if in loose terms, at the outset rather than as the result of a process of meticulous browsing through a set of candidate methodologies to decide which best fits your research question. This can happen either because your department is interested in building capacity around one particular technique, or because you want to become proficient in what you see is a methodology with future potential. In these cases, your research plan becomes an awkward exercise of reverse engineering, trying to fit a research question - not to mention the data available - into a methodology, while your literature review becomes a long and elaborate eulogy to your method of choice.

In my PhD, I apply agent-based modelling (ABM) to problems of governance in urban planning. This choice was in fact made at the very start. Still, I think ABM is a sensible and promising approach. Its mechanics are simple: for a given phenomenon of interest, and given past research, we specify which agents are involved, how each agent behaves in response to the set of conditions they will face, and how agents' actions are coordinated with one another. Because of the complexity arising from either a large number of (possibly heterogeneous) agents or from their interactions, aggregate outcomes may surprise us in that they might diverge from individual intentions.

ABM can be a means of learning about phenomena that occur at several scales and in which complex interdependencies between agents and processes are important - a staple of regional science, requiring integrative approaches which can deal with both quantitative and qualitative knowledge. Axelrod describes agent-based modelling, and simulation in general, as a third way of doing science, in addition to deduction and induction. Simulation, like deduction, he argues, 'starts with a set of explicit assumptions. But unlike deduction, it does not prove theorems with generality. Instead, it generates data suitable for analysis by induction. Unlike typical induction, the simulated data come from a rigorously specified set of assumptions regarding an actual or proposed system of interest rather than direct measurements of the real world.'

Put as beautifully as this, who can doubt the utility of such an approach? Well, reviewers can, for a start; and in particular, reviewers used to other modelling approaches, because it lacks an empirical basis. When confronted with it, reviewers will ask for data, parameter calibration and proof of validity. But some ABMs are difficult to calibrate and even validate. Validation of ABMs sometimes cannot go further than a qualitative evaluation of the reasonableness of the assumptions made and the logic of the causal relationships portrayed.

Other reviewers can be locked in the practices of their own

fields when it comes to assumptions about a certain system or phenomenon. What forces shape cities? Geographers will likely consider the policy making process, and the actions of different (income, ethnic, power) groups within the city. Urban economists will undoubtedly consider transportation costs, labour availability, economies of agglomeration and industrial specialization. Despite advances by the new economic geography, the treatment of space in these models is still very coarse. ABMs can facilitate the treatment of space, but only at the expense of making simplifying assumptions about other factors. Are we ready to take one step back so we can take two steps forward? It is one thing to acknowledge the simplifying assumptions that are commonly made in our own field to render problems treatable, but a different one to accept that other methodologies simplify where our field excels, despite the fact that the overall contribution may be positive.

Reviewers coming from qualitative methodologies, policymakers, and other societal groups usually respond to ABMs with disproportionate enthusiasm. They see, at first sight, enormous potential in the approach. They are familiar with detail-rich narratives of policymaking processes and they see in ABMs another way to tell the story. However, and despite progress, it is still difficult to translate the complexity of actor behaviour and institutional environment into a model that can satisfy their deep understanding of specific instances of that phenomenon. Prepare for these reviewers to be swiftly disappointed when they realize that the model does not adequately reproduce everything they know about the world.

There is always a problem for people working at disciplinary interfaces, or with new methodologies. Having to defend the value of our approach will undoubtedly make it stronger. But one unfortunate consequence might be that authors start self-selecting for journals that have proved to be friendlier to their methodologies. If, on the one hand, it is good that a methodology finds its outlets and communities of practice, it is also regrettable if different approaches do not come together under the umbrella of a common problem that needs solving, for fear of mutual lack of understanding.

ABMs have the potential to bridge different approaches - the qualitative and the quantitative - which is a key challenge for regional studies. For this to happen, teaming up with researchers from different fields should be the next inevitable step. Only with a debate structured around research domains and not around methodological approaches can we reach some sort of agreement on how to use ABM to model a phenomenon - on what is essential and what constitutes too much detail that obscures the important facts about a phenomenon.

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